TECMount™

286

USER'S MANUAL

HIGH POWER MOUNT

arroyo instruments

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Introduction

Thank you for choosing the **286 TECMount** from Arroyo Instruments. The **286 TECMount** is designed for high performance and long term use.

The **286 TECMount** integrates high power Peltier coolers for precise control and substantial heating and cooling capacity for your powerful devices. The standard **286 TECMount** has an operating range of +15°C to +85°C, and the high temperature (**-150**) version allows operation up to 150°C, covering a broad range of temperature control needs.

The **286 TECMount** comes standard with an integrated fan for additional cooling capacity. When used with the Arroyo Instruments **TECSource** temperature controllers, no additional power supply is needed to power the fan, or use a standard external 12V DC power supply when connecting to other temperature controllers.

The **286 TECMount** also offers all the features you would expect from a modern diode fixture, including:

- Hard nickel over 100% oxygen free copper thermal plate.
- M Series accessories for quickly adapting the mount to your application
- Designed to be quickly integrated with Arroyo's **TECSource** instruments.
- Industry-standard D-sub connector and pin-outs allow for quick integration into your application.

Installation and Use

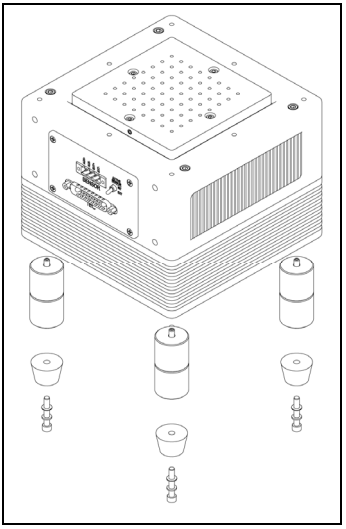
Consider how you plan to integrate the fixture into your application:

- Set it on your bench or optical table?
- Bolted to an optical table?
- Mount the cold plate horizontal or vertical?
- Mount to other instrument such as an integrating sphere?

The **286 TECMount** comes standard with the **M Series** accessory kit, which you can use to do many of these configurations. There are also several ¼"-20 mounting holes on the sides and face of the fixture, and four 8-32 mounting holes on the bottom of the fixture (the same holes used by the feet or posts).

Setting on a bench or optical table

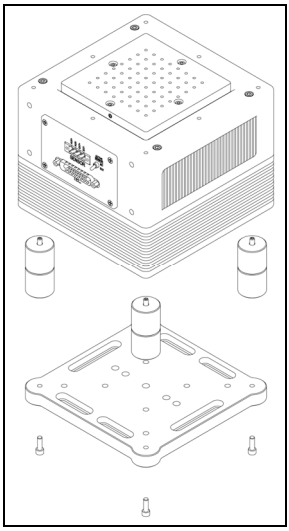
This is the simplest of configurations. Using the MP-2.00 posts, thread them into the four 8-32 holes on the bottom of the fixture. Next, using the 1/2"x 8-32 screws, a lock washer, and a flat washer, mount the feet to the bottom of each of the posts.



286 mounted on posts and feet

Bolting to an optical table

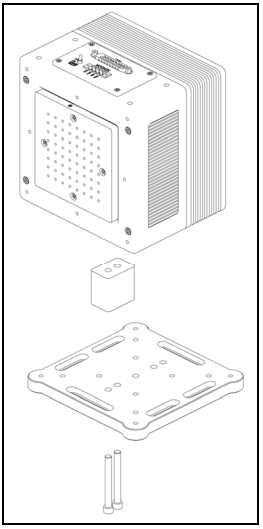
This configuration is very similar to the one above, but instead of the feet, you will use the MB-286 base. Start with the MP-2.00 posts, threading them into the four 8-32 holes on the bottom of the fixture. Next, using the 1/2"x 8-32 screws, mount the MB-286 base to the four posts.

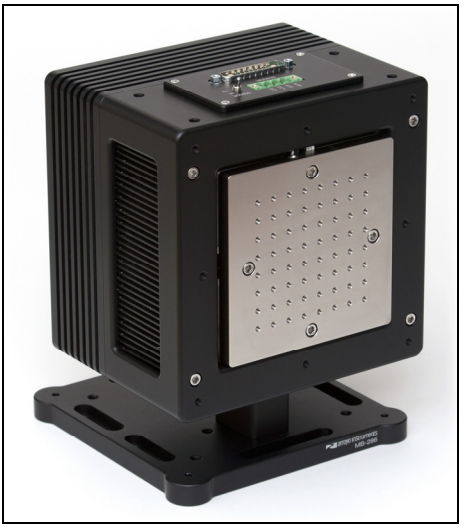


286 mounted on posts and base

Mounting the cold plate vertically

For applications that require a vertical cold plate, you can use the MB-286 base with the MR-1.50 riser to mount the **286** on its side. Set the **286** upside down, setting it on a soft cotton cloth to prevent scratching of the cold plate. There are two ¼"-20 mounting holes on the bottom of the fixture. Align the MR-1.50 riser to these two mounting holes and gently set the MB-286 base on top of that, holing it with one hand to stabilize it. Slide in one 2" ¼-20 bolt and turn a few times to get the threads started. Side in and start the second bolt, and then tighten both bolts.





286 mounted vertically on riser and base

Mounting to an integrating sphere or other assembly

In the case of mounting to another piece of equipment such as an integrating sphere, the **286** features a number of mounting holes on the front, rear, top, and bottom surfaces of the fixture. See the drawings in the *Mechanical Drawings* section below for more details on the size and location of the mounting holes.

Fan and Airflow

The **286** uses a high volume fan for cooling of the heat sink. For full performance, you must place the sides and bottom of the **286** *at least* 2" away from any other surface, or airflow will be constricted.

If you are using an Arroyo Instruments **TECSource** temperature controller, the fan can be powered directly from the **TECSource**. You will need to enable the

fan supply in the TECSource menu – see the TECSource manual for additional details on how to do that.

If you are using a third-party temperature controller, then you will need to provide a 12V DC power supply through the 17W2 connection. See the pin-out later in this document for the fan pin assignments.

Connecting to the TEC Controller:

Next, connect the **286 TECMount** to your temperature controller. The **5300-08-24 TECSource** is the recommended controller for this mount, although it will work with most temperature controller controllers designed for TEC applications, so long as the current and voltage requirements are met, which is a minimum of 8A and 24V. Make sure the temperature controller's current limit is set no higher than 14.8A, the maximum for this mount. If using an Arroyo **TECSource**, change the **Mount** setting in the menu to either **286** or **286-150**, depending on which mount type you have, and the **5300** will be automatically configured for the mount. Where possible, we recommend the use of Arroyo Instruments TEC cables. When connecting to a **5300 Series TECSource**, use p/n **1262-17W2**.

NOTE

Earth Grounding Considerations

The 17W2 connector shell is electrically connected to the housing. Depending on the wiring of your cables and instruments, this may or may not provide earth grounding of the fixture. Make sure the cable shell is earth grounded on both ends of the cable, and that the instrument makes connection from its connector to earth ground.

NOTE

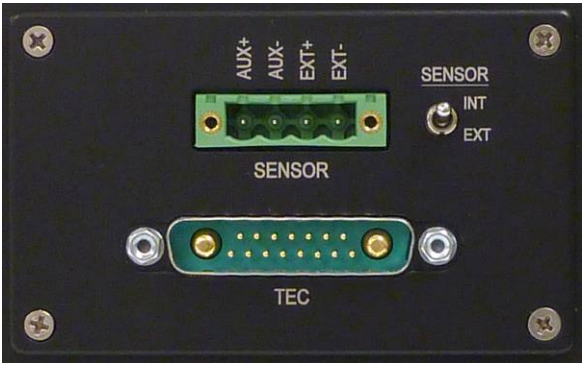
Arroyo Instruments offers TEC cables designed to connect directly between our **TECSource** products. If you use your own cables, ensure the connections are properly made between the instrument and the mount, and that proper grounding techniques are used. The pin-out of the connectors can be found later in this document.

Mounting Plates

The **286** TECMount is available in a standard bread board configuration with M3 holes on 10mm centers. Custom versions of the cold plate are available, contact the factory for details. Your **286** may be configured with a custom mounting plate, and if so, this manual should be accompanied by drawing for your plate.

Connector Pin-Outs

The **286** employs two connectors: a 17W2 for the temperature controller interface, and a 4-pin Phoenix quick disconnect for external/auxiliary sensor inputs.

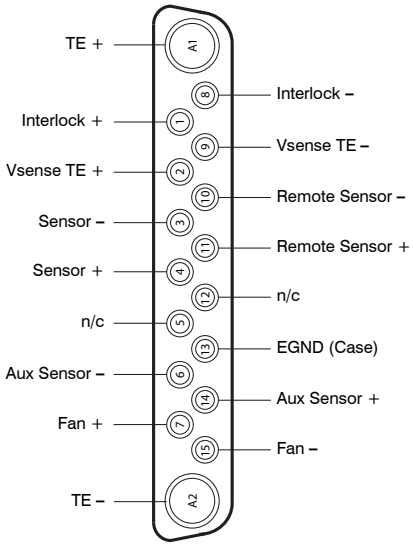


286 Connectors

Temperature Controller Interface

17W2 Pin	Description
A1	TE +
A2	TE –
1	Interlock + *(shorted to Interlock –)*
2	Vsense TE +
3	Sensor –
4	Sensor +
5	No connection
6	Aux Sensor –
7	Fan +
8	Fan – / Interlock –
9	Vsense TE –
10	Remete Sensor –
11	Remete Sensor +
12	n/c
13	EGND (Case)
14	Aux Sensor +
15	Fan – / Interlock –

17W2 Connector Pin-Out



17W2 Male

Interlock and Fan Pins

Interlock – and Fan – share a pin, and the same signal is present on both pins 8 & 15. In addition, because Interlock + is shorted to Interlock – inside the mount, pins 1, 8, & 15 are effectively the same on the **286** connector.

Auxiliary & External Sensor Interface

Phoenix Pin	Description
1	Auxilliary Sensor +
2	Auxilliary Sensor –
3	External Sensor +
4	External Sensor –

Phoenix 4-Pin Connector Pin-Out

Sensor Polarity and 4-Wire Connections

While the thermistor and RTD inputs are not polarized, when using a 4-wire RTD connection to the **286-xx-150** mount, it is important to properly connect the polarity of the sense wires to the sensor. Pins 4 and 11 should be one polarity (+) and pins 3 and 10 should be the opposite polarity (–). If polarities are not matched, the instrument will indicate a sensor error.

Using the Aux and Ext Sensor Inputs

The **286** features a SENSOR switch to quickly switch between internal and external temperature sensors. With the SENSOR switch in the INT position, the internal thermistor or RTD embedded in the cold plate is used to provide the feedback for the temperature controller (pins 3 & 4 [and 10 & 11 on **286-xx-150** models] on the 17W2 connector). With the SENSOR switch in the EXT position, the EXT+ and EXT**–** inputs on the Phoenix connector are connected to pins 3 & 4 [and 10 & 11 on **286-xx-150** models] on the 17W2 connector.

The AUX input is reserved for future use, and is wired directly to the Aux Sensor+ and Aux Sensor**–** pins of the 17W2 connector.

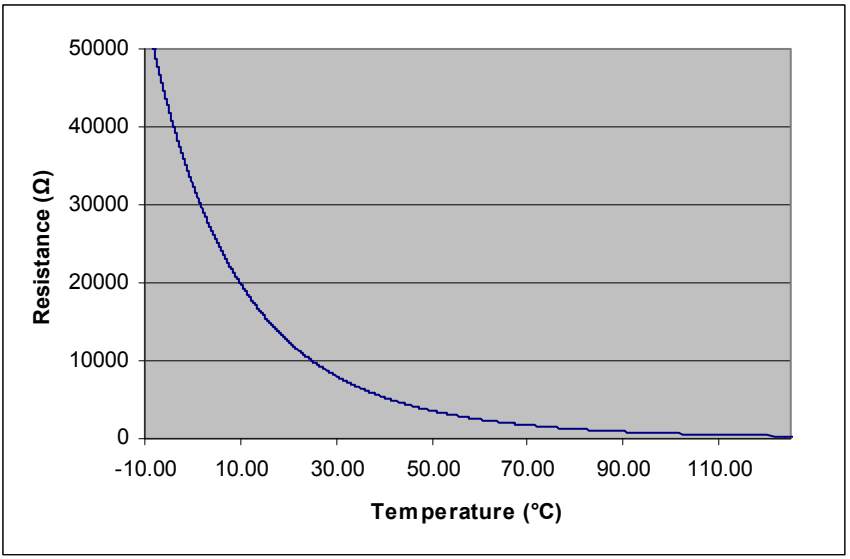
Technical Specifications

286 TECMount	
COLD PLATE	
Standard Plates	
286-01 Cold Plate	Bread board, M3 holes, 10mm centers
TEMPERATURE CONTROL	
Standard Version	
Temperature Range (°C)	+15 to +85
Sensor Type	BetaTHERM 10K3A1IA
Sensitivity	10kΩ @ 25°C
High Temperature Version	
Temperature Range (°C)	+15 to +150
Sensor Type	Platinum RTD
Sensitivity	100Ω @ 0°C, 0.00385 Ω / Ω / °C
TE Module (at 25°C)	
Maximum	14.8A / 32.8V
Recommended	10A / 28V
INPUT CONNECTORS	
Temperature Controller	17W2, male
Ext / Aux Sensor	Phoenix 4-pin
GENERAL	
Size (H x W x D) [in(mm)]	5.2 (132) x 6.4 (163) x 6.4 (163)
Weight [lbs (kg)]	
286, no accessories	9.8 (4.5)
286 on base or pedestal	11.8 (5.4)
208 on 2" posts and feet	10.4 (4.7)

Using the Thermistor on Standard Versions

The standard version of the **286 LaserMount** is equipped with a 10kΩ negative temperature coefficient (NTC) thermistor, specifically, the BetaTHERM 10K3A1. A thermistor works by translating temperature into resistance, with resistance decreasing as temperature increases (hence the 'negative coefficient').

Below is the response curve of the thermistor:



Resistance vs. Temperature Graph

As can be seen be the graph, the resistance of the thermistor drops very quickly. In the typical control range (0°C to 40°C), typical 10K thermistors offer good sensitivity to changes in temperature, and this is the range in which most 10K thermistors are typically used. 10K thermistors can be used at much higher temperatures, but will suffer poorer temperature stability performance because of the lower sensitivity.

All Arroyo temperature controllers support operation using a 10µA or 100µA thermistor bias, which limits the upper control range to 450kΩ or 45kΩ, respectively. To minimize noise and maximize stability, you should select highest current while still allowing you full operation across your required temperature range. The typical setting is 100µA, but your application will determine the actual needs.

The Steinhart-Hart Equation

As can be seen from the temperature versus resistance graph above, resistance varies inversely with temperature in a non-linear fashion. This relationship can be accurately modeled by polynomial equations, and one such being the Steinhart-Hart equation:

$$\frac{1}{T} = A + B * \ln(R) + C * \ln(R)^3$$

The coefficients for the BetaTHERM 10K3A1 thermistor are:

A = 1.12924×10^{-3}
B = 2.34108×10^{-4}
C = 0.87755×10^{-7}

These are the default coefficients for Arroyo Instruments temperature controllers.

Using the RTD on 150°C Versions

The **286-xx-150** LaserMount is equipped with a RTD sensor with a 0.00385 Ω / Ω / °C sensitivity. Like thermistors, RTDs also function by converting temperature into resistance, but unlike thermistors, RTDs increase in resistance as temperature increases. RTDs are also a fairly linear device, meaning they can be used across a much broader temperature control range.

As per IEC751, the resistance/temperature relationship is determined using one of two equations, dependent on the temperature or resistance value being measured. For resistances above the R_0 value (resistance at 0°C, typically 100Ω, as is the case with the RTD used in the **286-xx-150**) of the RTD, the following equation is used:

$$R = R_0(1 + AT + BT^2)$$

Below R_0, an additional term is added to the equation:

$$R = R_0[1 + AT + BT^2 + C(T - 100)T^3]$$

In both of these equations, R_0 is the resistance of the RTD at 0°C, and A, B, and C are the coefficients as defined by IEC751, through regression analysis, or by using the Callendar-van Dusen method.

For the Arroyo Instruments controllers that support RTD sensors, the default coefficients are different for this mount. They must be changed to use the 0.00385 Ω / Ω / °C curve, which has the following coefficients:

$A = 3.9080 \times 10^{-3}$
$B = -0.58019 \times 10^{-6}$
$C = -4.2735 \times 10^{-12}$
$R_0 = 100$

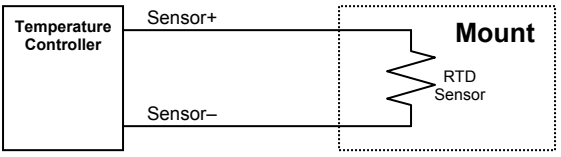
These coefficients can be changed in the Sensor menu.

2-Wire versus 4-Wire Measurements

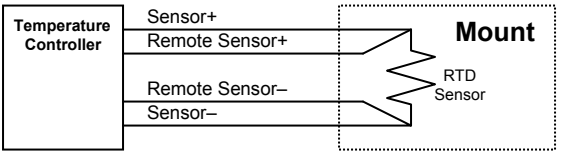
One concern in using RTDs are their relatively low resistance (typically 100Ω at 0°C), and small Ω/°C. Because of these two factors, the resistance of the cable used to connect to the sensor can create significant absolute error in the sensor measurement. Most Arroyo Instruments controllers offer two RTD measurement modes: a conventional two wire measurement mode, which is subject to this error, and a four wire measurement mode that uses separate sense and source lines to remotely sense the actual resistance of the RTD and eliminate the cable and connector resistances.

In the **286-xx-150 LaserMount**, the 4-wire connection is made inside the mount. To use this measurement mode, you must select 'RTD (4-wire)' as the sensor type.

The drawings below illustrate how 2-wire and 4-wire connections work. Note that 4-wire measurements require all four wires to be brought through the cable to the mount. The **1262-17W2** and **1264 TECSource** cables carry these connections through to the mount, but the **1260** cable does not.

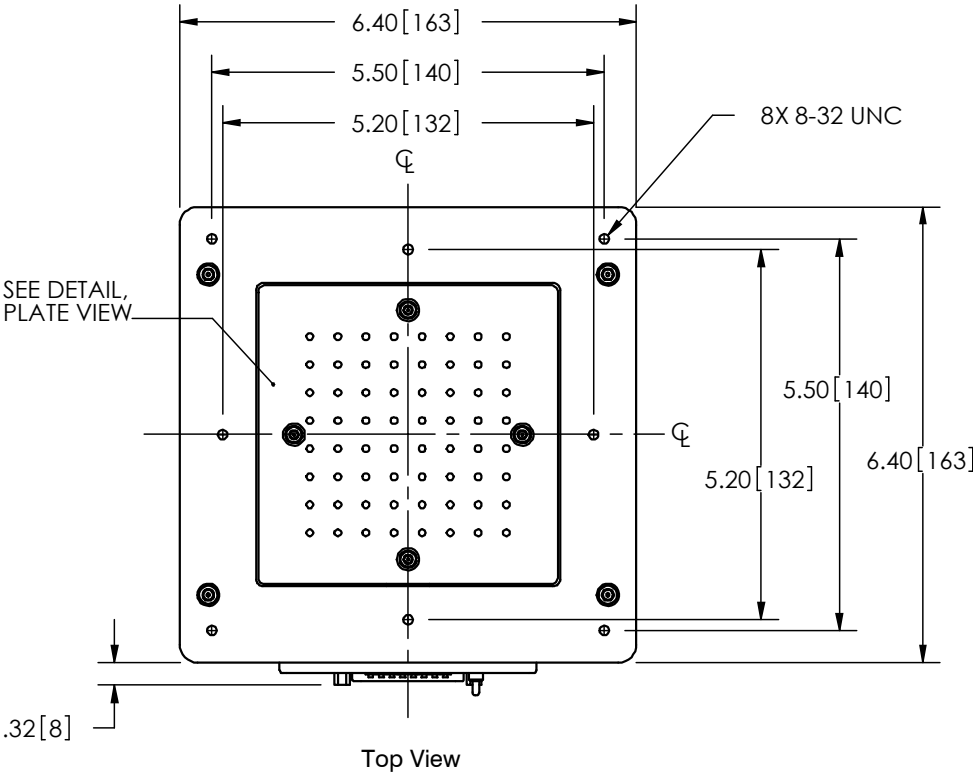


RTD 2-wire Measurement

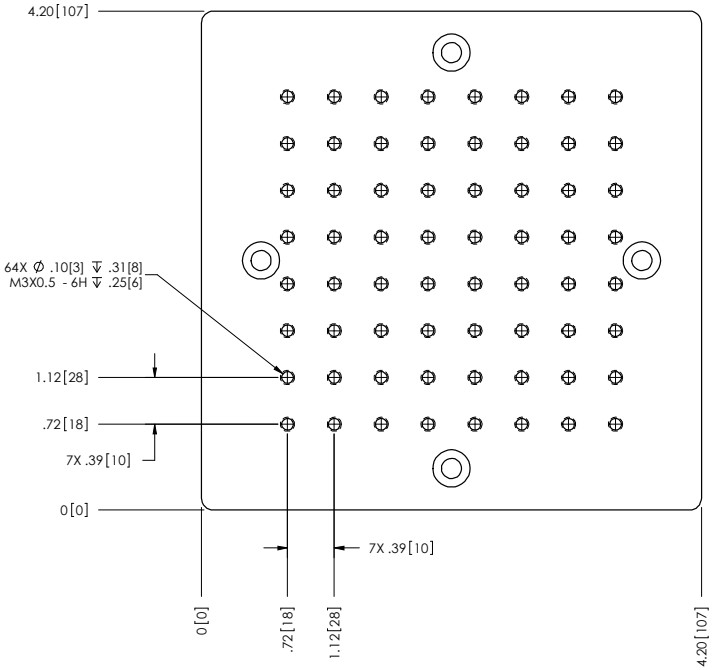


RTD 4-wire Measurement

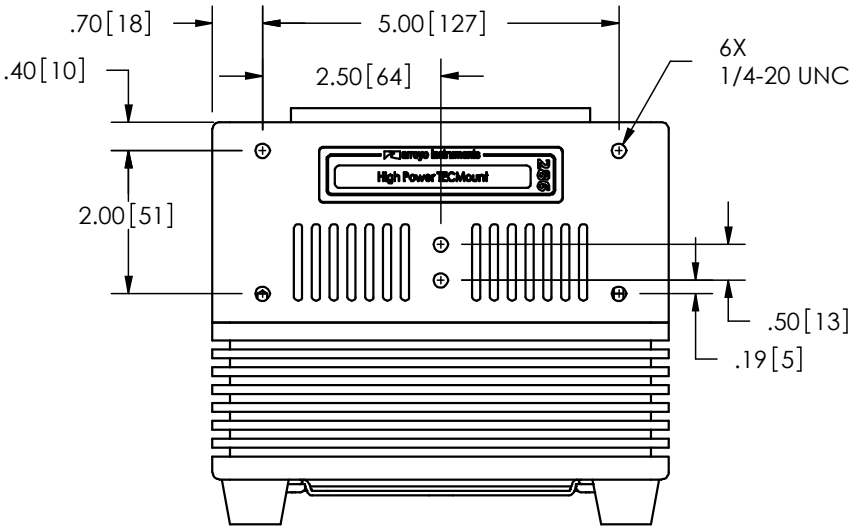
Mechanical Drawings



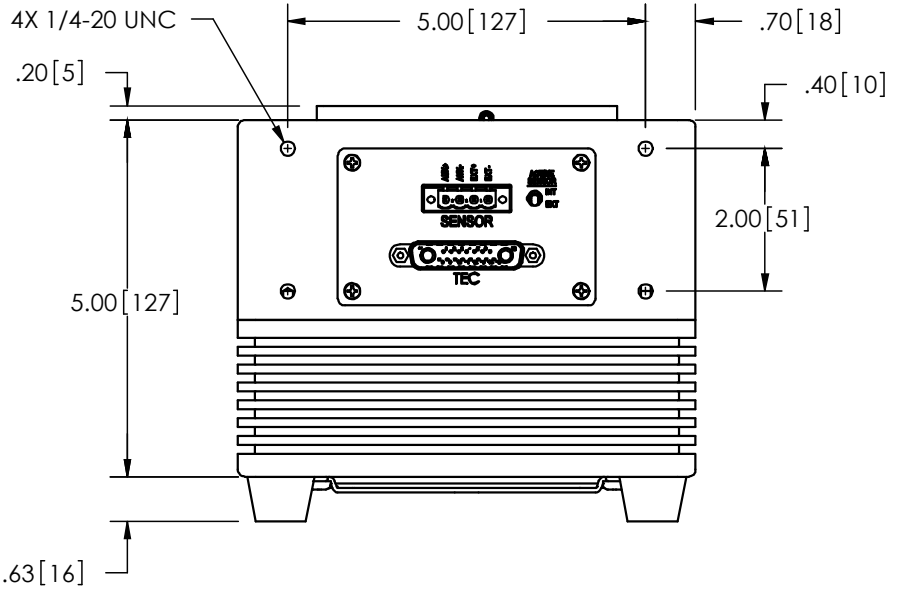
Top View



286-01 Plate Detail



Front View



Rear View

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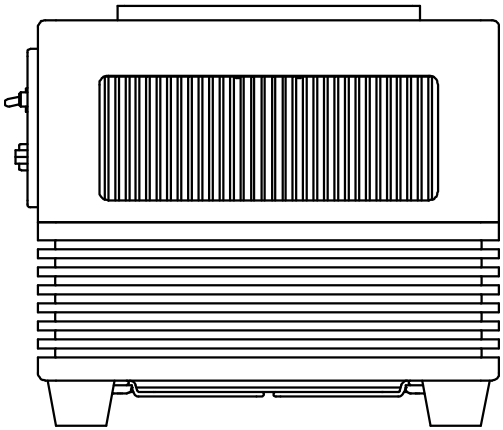
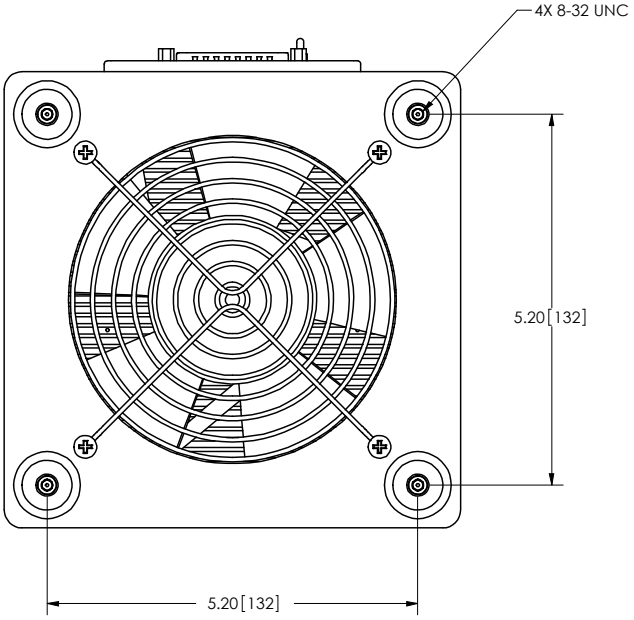


Side View



Bottom View

Warranty

Arroyo Instruments warrants this product to be free from defects in material and workmanship under normal use and service for a period of one (1) year from date of shipment. It does not apply when the product has been misused, altered or damaged by accident or abnormal conditions of operation. If found to be defective during the warranty period, the product will either be repaired or replaced at Arroyo Instruments's option.

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Service and Support

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